



# StorageTek™ L20/L40/L80 Series of Tape Libraries

General Information Manual

MT9104  
Revision: Nine



# L20/L40/L80 Series of Tape Libraries

General Information Manual

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# **Summary of Changes**

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<b>Date</b>	<b>Revision</b>	<b>Change</b>
May 2001	Initial Release	Refer to this edition for a description of the changes.
July 2001	Second	Refer to this edition for a description of the changes.
December 2001	Third	Refer to this edition for a description of the changes.
March 2002	Fourth	Refer to this edition for a description of the changes.
September 2002	Fifth	Refer to this edition for a description of the changes.
June 2003	Sixth	Refer to this edition for a description of the changes.
October 2004	Seventh	Refer to this edition for a description of the changes.
May 2005	Eighth	Refer to this edition for a description of the changes.
September 2006	Ninth	Cover, Copyright page, and Preface: Used Sun Microsystems, Inc. verbiage and branding.  Chapter 3: Removed the model, feature, and conversion bill numbers.

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# Preface

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This general information manual provides high-level information about StorageTek's L20, L40, and L80 Tape Libraries. For publications that contain more detailed information, see "Related Publications" on page xi.

This manual presents information for data processing and application-development personnel, such as MIS managers, storage administrators, system analysts, and performance specialists.

## ■ Organization

This manual contains:

- Chapter 1**     ["Product Overview"](#) introduces the libraries.
- Chapter 2**     ["Features and Benefits"](#) provides information about the benefits and features.
- Chapter 3**     ["Configuration Flexibility"](#) describes the flexibility of the libraries.
- Chapter 4**     ["Adaptive Media Technology"](#) describes how the libraries adapt to different media.
- Chapter 5**     ["Connectivity"](#) describes the libraries' connectivity options.
- Chapter 6**     ["Advanced Rotational Robotics"](#) describes the robotics.
- Chapter 7**     ["User Interfaces"](#) describes the ways in which a user can interact with and monitor the library.
- Chapter 8**     ["Typical Customer Environments"](#) lists the typical networks and environments in which the libraries operate.
- Chapter 9**     ["High Availability and Reliability"](#) describes the design of the libraries for reliability.
- Chapter 10**    ["Serviceability"](#) lists the available service options.
- Appendix A**   ["Specifications"](#) provides product specifications for the libraries.
- Glossary**    ["Glossary"](#) defines terms and abbreviations in this and other product-related publications.
- Index**       ["Index"](#) provides a way to quickly access specific information.

## ■ Alert Messages

Alert messages call your attention to information that is especially important or that has a unique relationship to the main text or graphic.

**Note:** A note provides additional information that is of special interest. A note might point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it pertains.

**CAUTION:**

**A caution informs the reader of conditions that might result in damage to hardware, corruption of data, or corruption of application software. A caution always precedes the information to which it pertains.**

**WARNING:**

**A warning alerts the reader to conditions that might result in long-term health problems, injury or death. A warning always precedes the information to which it pertains.**

## ■ Conventions

Typographical conventions highlight special words, phrases, and actions in this publication.

Item	Example	Description of Convention
Document titles	<i>System Assurance Guide</i>	Italic font
Emphasis	<i>not</i> or <i>must</i>	Italic font
File names	fsc.txt	Monospace font
Hypertext links	<a href="#">Figure 2-1 on page 2-5</a>	Blue (prints black in hardcopy publications)
URLs	<a href="http://www.sun.com">www.sun.com</a>	Blue (prints black in hardcopy publications)

## ■ Related Publications

Refer to the following publications for additional information:

Library Documentation/Training	Part Number
<i>L20 Tape Library CRU Instructions</i>	96002
<i>L20 Tape Library Installation Guide</i>	96052
<i>L20 Tape Library User's Guide</i>	95961
<i>L40 Tape Library CRU Instructions</i>	96031
<i>L40 Tape Library Installation Manual</i>	96053
<i>L40 Tape Library Ordering Guide</i>	MT5011
<i>L40 Tape Library User's Guide</i>	96005
<i>L40/L80 Tape Library Drive CRU Instructions</i>	96006
<i>L80 Tape Library CRU Instructions</i>	96051
<i>L80 Installation Manual</i>	96054
<i>L80 Tape Library Ordering Guide</i>	MT5012
<i>L80 Tape Library User's Guide</i>	96021
<i>L20/L40/L80 Installation, Configuration, Operation Training</i>	CRS-100507
Tape Drive Documentation	Part Number
<i>DLT™ 7000 Tape Drive Product Manual</i>	313134501
<i>DLT 8000 Tape Drive Product Manual</i>	Quantum 81-60118-02
<i>DLT1 Installation and Operations Guide</i>	Benchmark 000826-01
<i>DLT1 Product Specification</i>	Benchmark 000827-01
<i>Super DLT Tape Drive Product Manual,</i>	CD included with drive
<i>IBM Ultrium Tape Drive Guides</i>	CD included with drive
<i>Hewlett Packard Ultrium Tape Drive Manual</i>	CD included with drive
<i>Certance/Quantum LTO Tape Drive Product Manual</i>	CD included with drive
Other Publications	Part Number
<i>Crossroads Fibre Router User's Manual</i>	DS30110
<i>StorageNet 3300 Fibre Channel Router User Manual</i>	461273-01
<i>StorageNet 4300 Multi-Protocol Router User Manual</i>	461271-01

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The URL for StorageTek™ brand-specific information is:  
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### **Customer Resource Center**

The StorageTek product Customer Resource Center (CRC) is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation for StorageTek brand products. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. employees may enter the CRC through the SunWeb PowerPort.

The URL for the CRC is <http://www.support.storagetek.com>

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The URL for the StorageTek Partners site is:  
<http://members.storagetek.com>

The URL for partners with a Sun Partner Agreement is:  
<http://www.sun.com/partners/>

### **Hardcopy Publications**

Contact a sales or marketing representative to order additional paper copies of this publication or to order other StorageTek brand product customer publications in paper format.

# Product Overview

The L20, L40, and L80 series of tape libraries are self-contained, fully automated cartridge tape storage systems. This series of libraries provides an easy upgrade path from a 10-cartridge model to an 80-cartridge model.

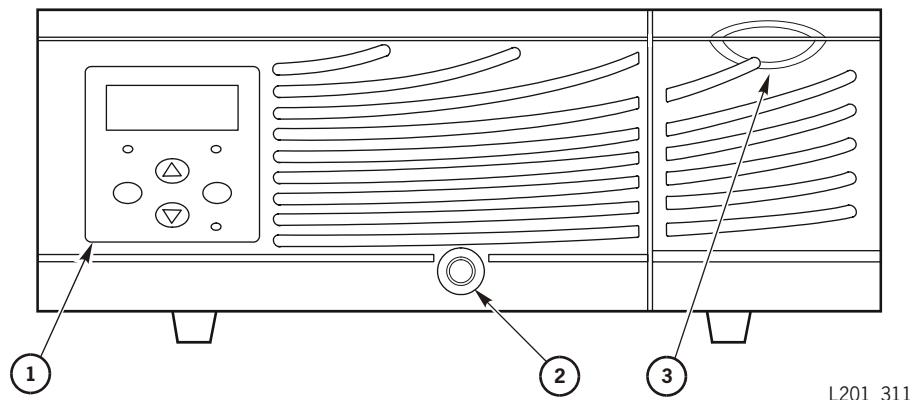
The libraries can be configured for either high voltage differential (HVD) or low voltage differential (LVD) small computer system interfaces (SCSI). The HVD interface allows longer cable lengths, but is slower and has fewer supported devices; the LVD interface restricts cable length, but is faster and has more supported devices. The libraries can be configured for SCSI interfaces or, with the addition of an internal or external Fibre Channel router, for Fibre-to-SCSI operation.

The L20 and L40 tape libraries can be placed on a desktop (with optional cosmetic cover and elastomer feet), the L80 tape library can be placed on the floor (deskside version with cosmetic cover and a base with casters), or any of the three can be mounted in a standard 483 mm (19 in.) rack.

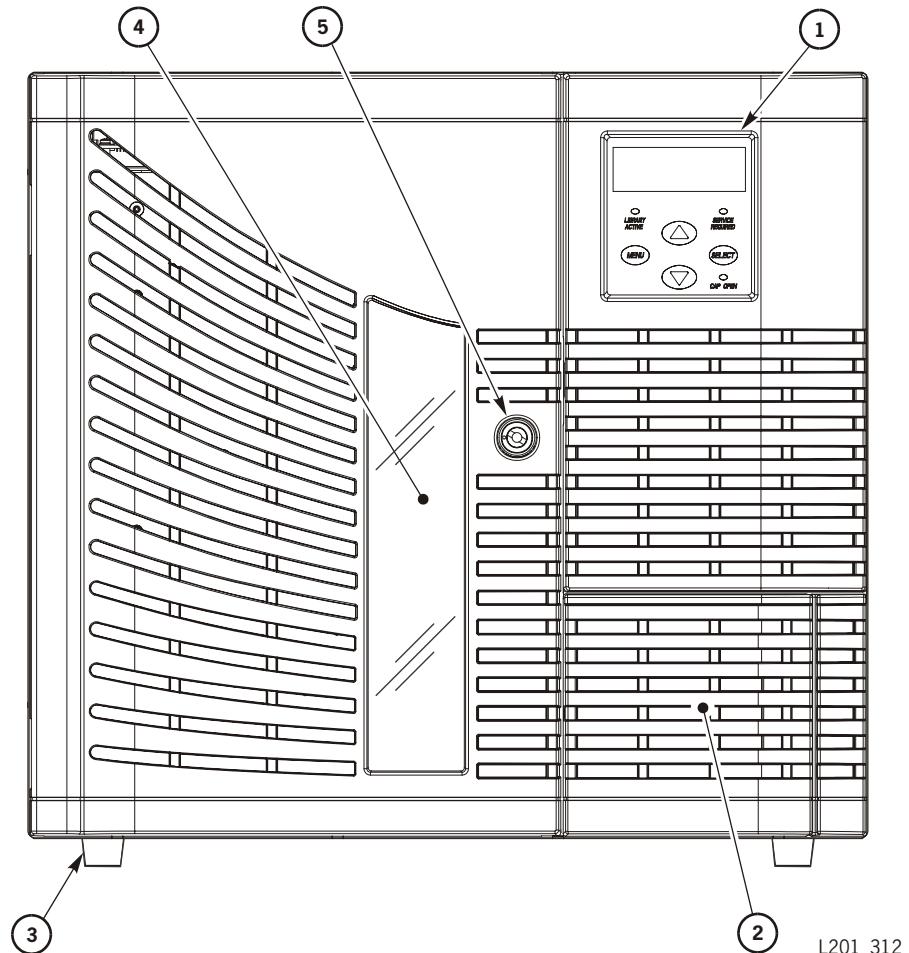
## ■ External Components

The following figures identify the external components.

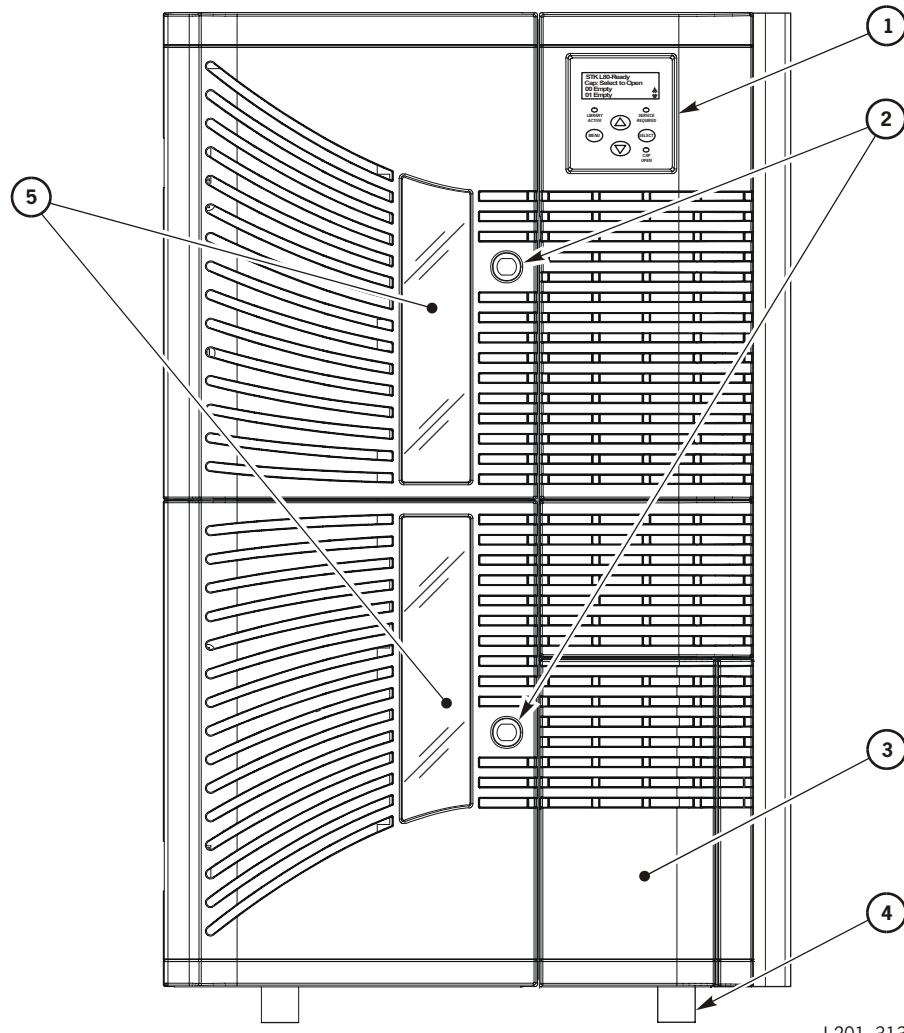
**Figure 1-1. L20 Tape Library Front View (L201\_311)**



1. Operator panel (including status display)—used for configuration and diagnostic testing
2. Lock for slide-out cartridge drawer—when open, you may access all cartridges
3. Cartridge access port (CAP)—used for entering and removing cartridges without interrupting library operation

**Figure 1-2. L40 Tape Library Front View (L201\_312)**

1. Operator panel (including status display)—used for configuration and diagnostic testing
2. Cartridge access port (CAP)—used for entering and removing cartridges without interrupting library operation
3. Elastomer feet for desktop version
4. Viewing window
5. Door lock

**Figure 1-3. L80 Tape Library Front View (L201\_313)**

L201\_313

1. Operator panel (including status display)—used for configuration and diagnostic testing
2. Door locks
3. Cartridge access port (CAP)—used for entering and removing cartridges without interrupting library operation
4. Casters for deskside version
5. Viewing windows

## ■ Power System

The L20 and L40 libraries have one standard power supply. For the L40, you can order an optional second supply to provide redundant power to the library and drives. The L80 has two standard power supplies, and you can order two redundant power supplies.

When you use the redundant power supplies, each supply should be plugged into a separate circuit and powered-on to provide redundant power. If one supply fails, the second supply automatically provides power.

## ■ Comparison of Models

This table provides a quick overview of the libraries.

**Table 1-1. Library Model Comparison**

Library	L20	L40	L80
Cartridge Slots	10, 20	20, 40	40, 60, 80
Height (in rack units)	4 U	10 U	18 U
Drives	1–2	1–4	1–8
<b>Capacity (maximum uncompressed)</b>			
DLT 8000	800 GB	1.6 TB	3.2 TB
SDLT 220	2.2 TB	4.4 TB	8.8 TB
SDLT 320	3.2 TB	6.4 TB	12.8 TB
SDLT 600	6 TB	12 TB	24 TB
Ultrium 1	2.0 TB	4.0 TB	8.0 TB
Ultrium 2	4.0 TB	8.0 TB	16.0 TB
Ultrium 3	8.0 TB	16.0 TB	32.0 TB

# Features and Benefits

The following table lists features and benefits of the libraries.

**Table 2-1. Features and Benefits**

Features	Benefits
From 10 to 80 cartridge cells	Expandability protects your investment by allowing you to add capacity as you need it.
Mixed media support, simultaneously	Creates freedom to adapt to future tape drive technology without changing libraries.
Multiple upgrade path options	Allows you to increase the performance and capacity quickly and easily. In-frame upgrade paths allow you to change the number of drives, number of media slots, and type of drive technology, or you can perform a frame-to-frame upgrade.
Library Status tool	Helps reduce administration costs and maximize operational efficiency. Facilitates remote monitoring of the library, drives, CAP, media, and storage cells. Also permits library reboot, firmware (code) upgrades, and generates valuable reports to perform remote troubleshooting.
Library Admin	An upgrade of the Library Status tool, this provides enhanced maintenance and diagnostic capabilities including a virtual view of the library's cells, statistics on the library, drives, cells, and cleaning cartridges, the ability to view and modify the configuration of the library, drives, and network, and run diagnostic routines to verify the functionality of the library, drives, and the robotic movements.

**Table 2-1. Features and Benefits (Continued)**

Multiple leading tape technologies offered, including: Linear Tape–Open (LTO) Ultrium, Super Digital Linear Tape (SDLT), and DLT 8000 drives	Provides high availability, high throughput, and quick backups.
Cartridge access port (CAP)	Permits quick and easy loading for batch jobs without interrupting library operation.
SAN-ready option	Connectivity to Fibre Channel. Allows data to be shared by multiple servers and provides simple scalability, ensuring enterprise-class business continuity.
Compact PCI™ expansion card	Ensures expandability and standards compliance.
Auto-sensing and configuration	Prevents improper orientation of cartridges. At initialization or power-on, the robot attempts to pick up any unreadable, unlabeled, or improperly placed cartridges. If unretrievable, library status will be “not ready.”
Autoloader Mode (L20 only)	Easily configured from the operator panel, the autoloader mode provides sequential operation of the library, allowing you to control the automatic mount and dismount for a series of cartridge tapes. This mode does not require sophisticated software, yet still provides unattended backup that reduces administrative costs.
Monitoring of cooling system and redundant power supplies and fans (L40 and L80)	Ensures maximum uptime and availability of your critical data. The redundant power supply (L40 and L80) provides the ability to operate from two separate AC circuits.
Hot-swappable tape drives, power supplies, and fans	The drives are mounted on customer replaceable drive trays, which makes drive replacement easy, requires no special tools, and does not interrupt library operation (when configured with more than one drive).
High-resolution GUI (graphical user interface)	Intuitive operation ensures easy use.
HVD or LVD SCSI or Fibre Channel interfaces available	Allows adaptability to your system’s configuration.

**Table 2-1. Features and Benefits (Continued)**

SNMP support	The libraries support version 1 of the simple network management protocol (SNMP). Support of SNMP allows systems administrators to query the library for configuration, operation, and statistical information. SNMP also enables the library to notify the administrator of potential problems.
Digital vision camera system	High resolution camera system used for calibration and configuration of the library, tape drives, and media. This precision helps reduce wear on the tape drives, media, and cartridge cells.

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# Configuration Flexibility

The flexibility of the libraries provides unparalleled investment protection. You can configure a library to meet your present needs, then, as your requirements grow, so can the library. Upgrade choices allow you to add more cartridge capacity and drives to expand from a smaller back-up-and-restore solution with a minimum of one drive and 10 cartridges to a powerful product with up to eight drives and 80 cartridges. In the same footprint, you can customize the library by adding a combination of drives in the drive column. Inserting cartridges into the library is also easy through the library's cartridge access port (CAP).

## ■ Adding Cell and Drive Capacity

If your storage needs have increased, you might want to increase your cell capacity and the number of drives in your library. You can do this either by ordering a conversion bill or the desired Sun Microsystems, Inc (Sun) ordering part number listed in the Ordering Guide for your library.

With an upgrade conversion bill, you are able to increase the capacity of your library within the same library frame. You will receive an upgrade module and a set of instructions that will direct you through the upgrade process. You will use the operator panel to have the firmware update the personality module to reflect the increased cell capacity of your library. Then, if desired, you can add additional external SCSI cables, drives, and media that can be ordered separately.

With the Sun ordering part number, you can increase your capacity with a frame upgrade. You actually receive a physically larger frame. You will use the external SCSI cables, drives and media from your old library, and might want to order additional external SCSI cables, drives, and media to fill the new library.

## ■ Cartridge Capacity

The tape management software locates cartridges by their cell numbers. You determine the library capacity (total number of cells) when you order the library. You can order the L20 with 10 or 20 cells, the L40 with 20 or 40 cells, or the L80 with 40, 60, or 80 cells.

**Note:** For third-party software licensing reasons, StorageTek can configure the L20 with 15 cells, the L40 with 32 cells, and the L80 with 64 cells.

Do not include the drive slots and the CAP cells when determining data-cell capacity. In fully configured libraries, if Auto Clean is *not* enabled, you can use the cleaning cells to

store data cartridges. If Auto Clean *is* enabled, the cleaning cells must contain cleaning cartridges.

Although you are able to see all the storage cells, the software only recognizes the data cells that are designated for the capacity that you ordered, which is controlled by the personality module. You can attach a cell barrier clip (in the L40 and L80) to indicate the configuration of the cell capacity in your library to ensure that cartridges are manually inserted in viable positions.

These configuration options enable you to add cartridge capacity without changing libraries. In addition, simpler mechanics and pinpoint cartridge location translate to faster, more accurate movements.

## ■ Cartridge Access Port

You insert cartridges into the library through the cartridge access port (CAP). The CAP holds one cartridge in the L20, two cartridges in the L40, and five in a removable magazine in the L80. With the CAP, you can load batch jobs quickly and easily without interrupting library operation.

## ■ Compatibility with Storage Solutions

Complementing its own software products, StorageTek has teamed with leading software vendors in the areas of backup and archival, hierarchical storage management, media management, disaster recovery, and ServerFree backup. These relationships ensure easy connectivity with leading solutions, such as those shown in [Table 3-1](#).

**Table 3-1. Compatible Storage Solutions**

Vendor	Product
CommVault	Galaxy
Computer Associates	ARCserv BrightStor
Hewlett-Packard	OmniBack
Legato	NetWorker
Sterling	Alexandria
Tivoli	Tivoli Storage Manager
Veritas	Backup Exec NetBackup

# Adaptive Media Technology

One of the greatest strengths of the libraries is the Adaptive Media Technology (AMT), which encompass the ability to read the volume serial number (VOLSER) labels on the cartridges stored in the library. AMT consists of a collection of innovations that allow the library to accommodate multiple drive types and their corresponding media simultaneously. The libraries will also support new drive and media types when they are available.

## ■ Supported Drives

The libraries support Digital Linear Tape (DLT) 7000E, 8000, Super DLT (SDLT) 220, 320, and 600 from Quantum Corporation; DLT1 from Benchmark Storage Innovations, Inc; and Linear Tape—Open (LTO) Ultrium drives from the LTO Consortium (Seagate/Certance/Quantum).

You may mix drive types within a library, but please observe the following cautions:

- StorageTek does not advise you to mix DLT 7000 and DLT 8000 drives in the same library. When you place a DLT 7000 cartridge into a DLT 8000 drive, the drive will read but not write on the cartridge. When you place a DLT 8000 cartridge into a DLT 7000 drive, the drive assumes that the cartridge is blank and writes over the existing data on the cartridge.
- StorageTek does not advise mounting SDLT 320-formatted cartridges into SDLT 220 drives. An SDLT 220 drive will overwrite the 320 data. To avoid this, carefully manage the locations of the cartridges within your library, and designate the correct drive type for your read/write operations.
- DLT1 drives use only DLTtape IV cartridges.

The flexibility of using different types of drives protects your investment. For example, you can initially purchase an L80 tape library with DLT 8000 drives. As performance requirements increase, you can add Ultrium drives. This flexibility also enables smooth data migration from one type of media to another—all within the same library. Your system adapts freely to future drive technology without requiring you to purchase a new library.

## ■ Audit of Library

An audit is how the library keeps track of all cartridges within the library. An audit occurs when you:

- Power-on the library
- Open and close the door (drawer in the L20)
- Enter an audit request at the host console

The camera on the hand reads the labels on the cartridges, microcode assigns the cell locations, and the LLC processor card records the assignments. When the Media Check feature is on, the robot attempts to pick up any unreadable, unlabeled, or improperly placed cartridges. If unretrievable, library status will be “not ready.”

## ■ Tape Management Software

The tape management software provides the instructions to perform tape read and write operations and robotic move operations. When the library is in automated mode, these operations occur without manual intervention. The software determines where the cartridge is located by accessing audit data uploaded from the library. The software then allocates the drive to receive the cartridge.

## ■ Electronics Module

The electronics module (EM) consists primarily of the LLC card, which is inside the EM, on the left side as you face the EM from the rear of the library. The interface connections and personality module are on the EM frame. One or two Fibre Channel router cards can also be installed in the EM depending on the library model.

### LLC Card

The LLC card, in the EM, is the processor card. It contains all the hardware necessary to maintain the robot, servo, and vision control. It also contains an operator panel interface, a SCSI interface (HVD or LVD, selectable), an Ethernet interface, eight (L80), four (L40), or two (L20) serial drive ports, and a Customer Services Engineering (CSE) port.

The card stores the library capacity information from the personality module and the volume serial numbers of the cartridges in the library cells.

### Personality Module

The personality module is a connector that stores the library cell capacity information (10, 20, 40, 60, or 80 cells). The library will not operate unless an authorized module is attached to the rear of the EM.

# Connectivity

The libraries include an embedded small computer system interface (SCSI) controller that supports both single-ended, low voltage differential (LVD) and high voltage differential (HVD) UltraSCSI. You do not need additional interface cards to support synchronous transfer rates up to 40 MB/s (native).

StorageTek has designed the libraries to make the transition from SCSI to Fibre Channel as easy as possible. You can convert the SCSI library (LVD only) and drives to Fibre Channel through an optional Fibre Channel router mounted either internal or external to the library. The L40 and L80 are customer upgradable, and the L20 is field upgradable by an authorized partner or StorageTek service call. In addition, once the Fibre Channel control path is released, you can upgrade the library as other Fibre Channel drives become available.

The library interface is either HVD or LVD SCSI or, with the addition of an optional Fibre Channel router card, Fibre Channel-to-SCSI LVD. The Fibre Channel router converts the library and SCSI signals to Fiber Channel protocol. One router card converts up to four drives. The second router (L80 only) converts the additional drives. In addition, two external Fibre Channel routers are available—one supports up to four drives, the other supports eight drives (L80 only). Properly terminate each SCSI bus with an LVD or LVD/SE multimode terminator.

In addition to the internal fibre channel router card, two external routers are available. The SN3300 Fibre Channel Router supports up to four drives, the SN3400 Multi-protocol Router supports up to eight drives and is commonly used with the L80. Two SN3300 routers may also be used with the L80 to support up to eight drives.

**Table 5-1. Compatible Drives and Interfaces**

Drive Name	Sustained Native Transfer Rate	Interface		
		HVD <sup>1</sup>	LVD <sup>2</sup>	FC
DLT 8000	6.0 MB/Sec	Ultra-2 SCSI HVD=Fast 40	Ultra-2 SCSI LVD= 80MB/sec, SE=40MB/sec	N/A
SDLT 220	11 MB/Sec	Ultra-2 SCSI HVD=Fast 40	Ultra-2 SCSI LVD= 80MB/sec, SE=40MB/sec	N/A
SDLT 320	16 MB/Sec	Ultra-2 SCSI HVD=Fast 40	Ultra-2 SCSI LVD= 80MB/sec, SE=40MB/sec	Yes
SDLT 600	36 MB/Sec	N/A	Ultra-3 SCSI LVD= 160 MB/sec, SE=40 MB/sec	N/A
Seagate/Certance Ultrim 1 LTO <sup>3</sup>	16 MB/Sec	Ultra-2 SCSI HVD=Fast 40	Ultra-2 SCSI LVD= 80 MB/sec, SE=40 MB/sec	Yes
Seagate/Certance Ultrim 2 LTO <sup>3</sup>	34 MB/Sec	N/A	Ultra-2 SCSI LVD= 80 MB/Sec	Yes
Seagate/Certance Ultrim 3 LTO <sup>3</sup>	68 MB/Sec	N/A	Ultra-3 SCSI (Ultra-160) LVD 160MB/Sec	N/A
IBM Ultrim 1 LTO	15 MB/Sec	Ultra-2 SCSI HVD=Fast 40) <sup>4</sup>	Ultra-2 SCSI LVD 80 MB/Sec	Yes
IBM Ultrim 2 LTO	35 MB/Sec	N/A	Ultra-3 SCSI (Ultra-160) LVD 160MB/Sec	Yes
IBM Ultrim 3 LTO	80 MB/Sec	N/A	Ultra-3 SCSI (Ultra-160) LVD 160MB/Sec	N/A
HP Ultrim 1 LTO	15 MB/Sec	Ultra-2 SCSI HVD=Fast 40) <sup>4</sup>	Ultra-2 SCSI LVD 80 MB/Sec, SE=40MB/sec	Yes
HP Ultrim 2 LTO	30 MB/Sec	N/A	Ultra-3 SCSI (Ultra-160) LVD 160MB/Sec	Yes
HP Ultrim 3 LTO	80 MB/Sec	N/A	Ultra-4 SCSI (Ultra-320) LVD 160MB/Sec	N/A

1. The maximum burst speed of data transfer for the HVD interface is at 40 MB/s
2. The maximum burst speed of data transfer for the LVD interface varies depending upon the type of SCSI interface.
3. Certance is owned by Quantum Corporation.

The Fibre Channel to LVD SCSI router:

- Allows the library to be connected to a 1 GB (2 GB for the external Fibre Channel router) Fibre network (arbitrated loop and switched fabric)
- Leverages your SCSI LVD storage investments
- Makes it easy to connect in a Fibre network
- Allows ServerFree backup (automated transfer of data from drive to drive without host intervention)
- Increases the host-to-library distance from 12 m (39.37 ft) to 500 m (1,640 ft)
- Allows connectivity between Fibre networks and the library and SCSI drives

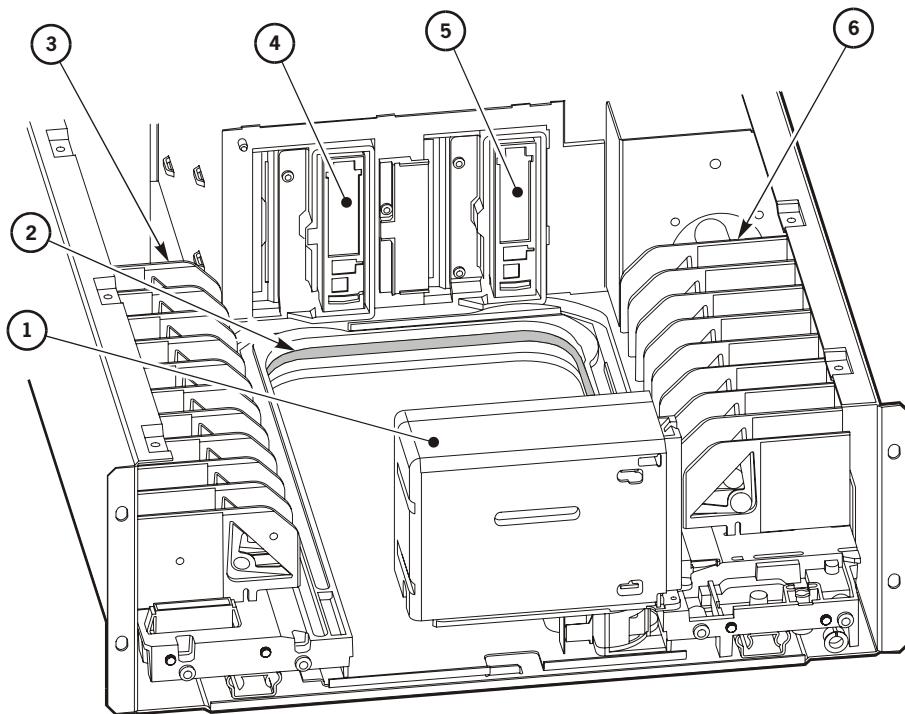
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# Advanced Rotational Robotics

StorageTek's libraries use advanced rotational robotics to move cartridges among the CAP, storage cells, and drives inside the library. The space-efficient rotational robots use less rack space per number of cartridges than most competing products.

## ■ L20

The L20 picker, on a U-shaped track, contains a digital vision camera system. The U-shaped track is attached to the floor of the library. The track enables the picker mechanism to travel 180 degrees, thereby enabling the picker to access all cells in the library. The library tracks cartridges by the volume serial numbers and associated cell locations. The library defines the cartridge locations during the audit and stores the information in two places: the library's memory and the tape management database. The camera reads the bar code volume serial numbers on the cartridges and the library calibration targets. [Figure 6-1 on page 6-2](#) shows the internal view of the L20 tape library.

**Figure 6-1. L20 Tape Library Internal View** (L201\_314)

L201\_314

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Picker—moves along its U-shaped track and removes (“gets”) and places (“puts”) cartridges into storage cells or drives.</li> <li>2. U-shaped track (for robot movement)</li> </ol> | <ol style="list-style-type: none"> <li>3. Cartridge storage cells</li> <li>4. Drive 0</li> <li>5. Drive 1</li> <li>6. Cartridge storage cells</li> </ol> |
|--|--|

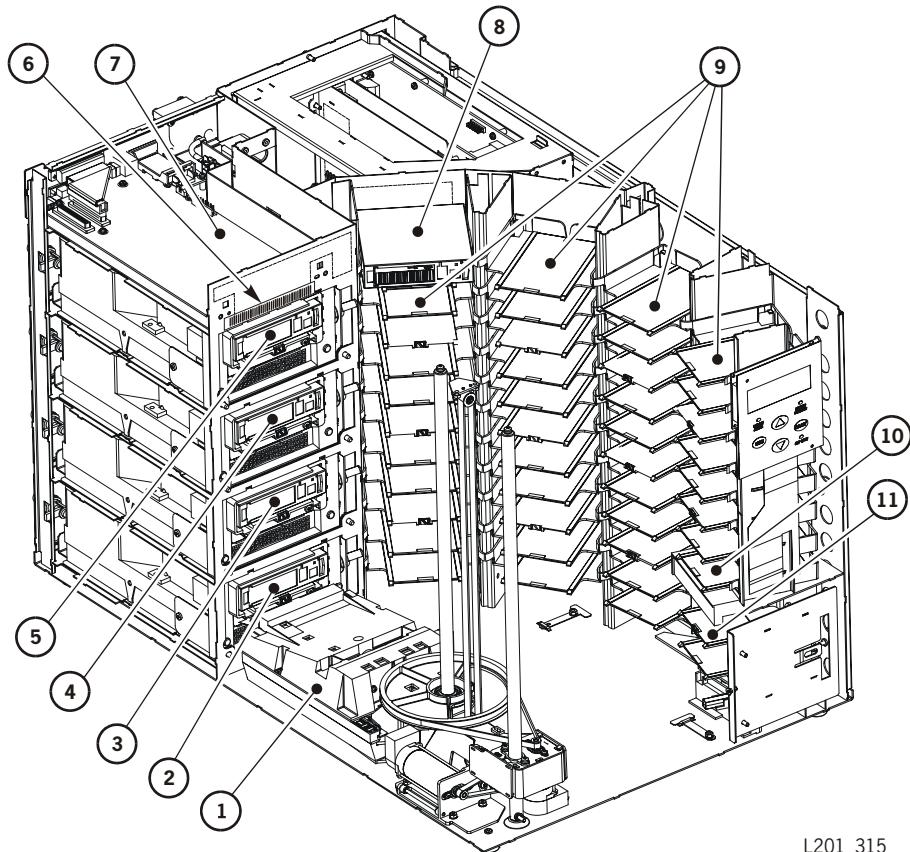
## ■ L40 and L80

In the L40 and L80, the robot, behind the front door, consists primarily of the:

- Theta assembly for lateral movement
- Z drive assembly for vertical movement
- Hand to mount and dismount cartridges

Most of the robotic components are mounted on the Z shaft. The hand on the Z carriage moves up and down the shaft to access the cells. The cells are stacked in columns; the columns are arranged around the robot. The hand rotates about the shaft.

The camera, on the hand, reads the bar code volume serial numbers on the cartridges, and the library and CAP calibration targets.

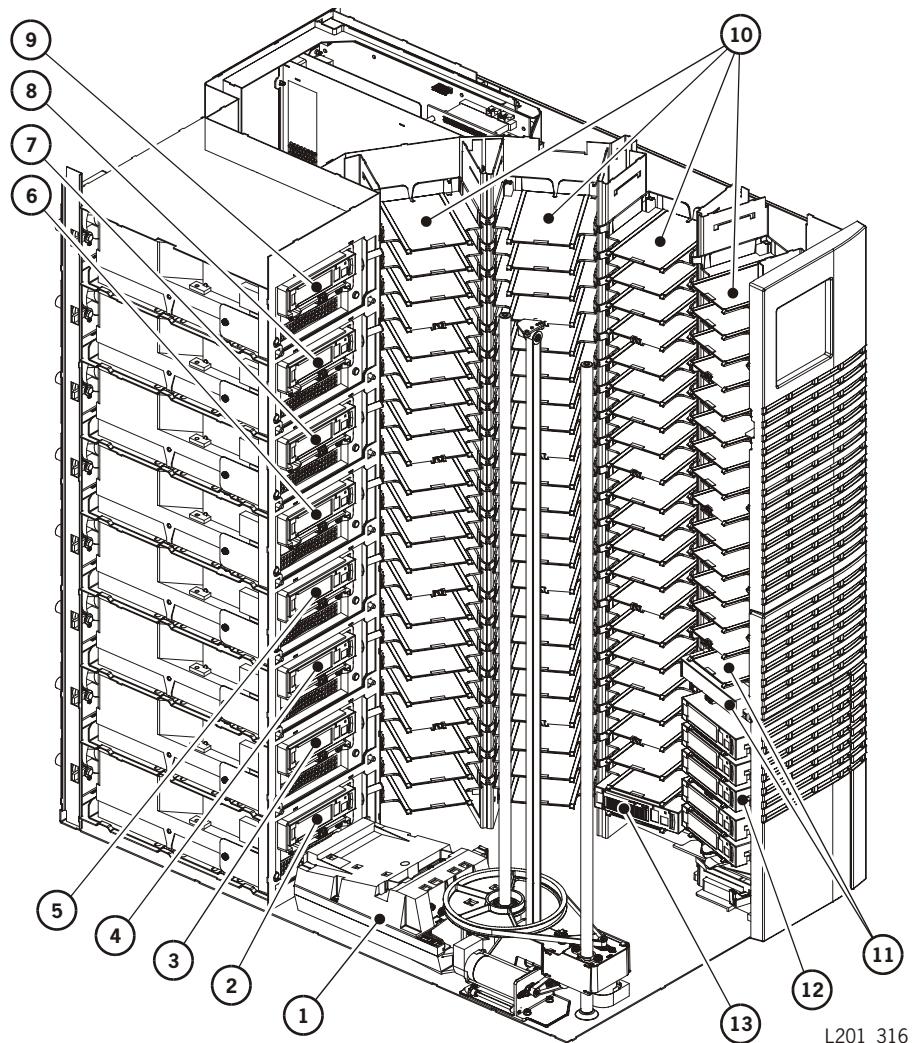
**Figure 6-2. L40 Library Internal View (L201\_315)**

L201\_315

- |   |   |
|---|---|
| 1. Hand assembly                                      | 7. Fibre Channel router card (optional)     |
| 2. Drive 3  | 8. Cartridge                                |
| 3. Drive 2  | 9. Columns 0 through 3, with 3 on far right |
| 4. Drive 1  | 10. Cleaning cartridge cell                 |
| 5. Drive 0  | 11. CAP cells (two)                         |
| 6. Library vision calibration label and master target |   |

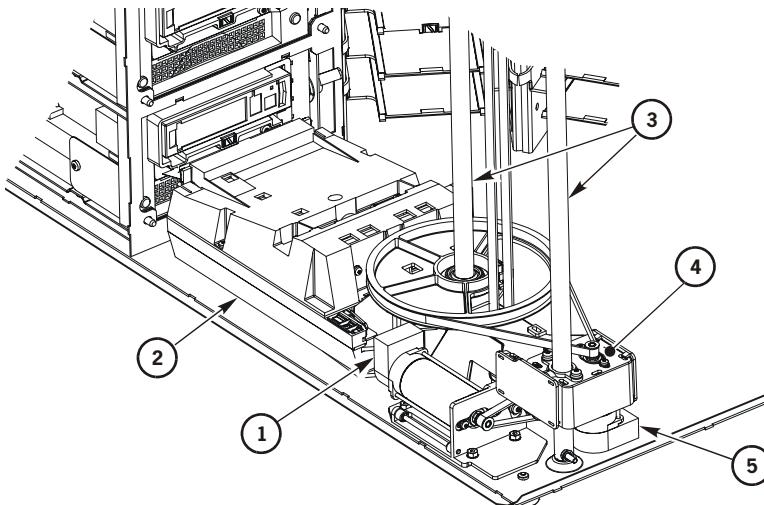
**Note:** The top drive is Drive 0. If all four drives are installed, the top drive is Drive 0 and the bottom is Drive 3. If drives are installed only in the two middle slots, the top drive installed is Drive 0 and the drive below it is Drive 1.

Figure 6-3. L80 Library Internal View (L201\_316)



- L201\_316
- |                        |  |
|------------------------|--|
| 1. Hand                | 8. Drive 1   |
| 2. Drive 7 (See note.) | 9. Drive 0   |
| 3. Drive 6             | 10. Cartridge storage cells (columns 0 through 3, with 3 on far right) |
| 4. Drive 5             | 11. Two optional cleaning cartridge cells                              |
| 5. Drive 4             | 12. CAP with removable five-cell magazine                              |
| 6. Drive 3             | 13. Cartridge  |
| 7. Drive 2             |  |

**Note:** The top drive is Drive 0. If all eight drives are installed, the top drive is Drive 0 and the bottom is Drive 7. If drives are installed only in the two middle slots, the top drive installed is Drive 0 and the drive below it is Drive 1.

**Figure 6-4. L40 and L80 Robotic Components (L201\_317)**

L201\_317

- |                  |                |
|------------------|----------------|
| 1. Z motor       | 4. Z carriage  |
| 2. Hand assembly | 5. Theta motor |
| 3. Z shafts      |                |

## ■ Advanced Hand-Camera Design

The hand (or picker in the L20) is composed primarily of the reach carriage, reach belt, reach motor, and the camera. The hand mounts to the Z carriage on the Z shaft. The robot can exchange 200 cartridges per hour, so your job is completed faster.

The camera reads the volume serial numbers on the cartridge labels after you insert them into the tape library. The library records cartridge numbers and location. In addition, StorageTek's camera uses an innovative design, the Digital Vision Camera System, that accommodates different media types.

## ■ Digital Vision Camera System

StorageTek's libraries use a patented Digital Vision Camera System for cartridge management, adaptive targeting, and self-calibration. Self-calibration enables the library to adapt to mechanical parameters that might change over time. This feature creates a more robust, reliable library that will perform dependably over the long term.

Most automated libraries use a common laser bar-code scanner for reading labels on cartridges. Common scanners—such as those used in grocery stores—do not provide the advantages of StorageTek's Digital Vision Camera System, which can read marginal bar-code labels. In addition, the Digital Vision Camera System detects empty cells while in motion, reducing audit time.

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# User Interfaces

The user interfaces include the operator panel and the Ethernet/Web port.

## ■ Operator Panel

This display has a simple menu system that presents all necessary configuration and status functions, as well as instructions for configuring the library.

The operator panel displays library and drive status, drive and media type, configuration, diagnostic sequences, and an event log to help you keep the library operating and diagnose problems quickly.

## ■ Library Status Tool

By connecting a 10baseT Ethernet interface to the library's Ethernet port, you can easily monitor the library activity remotely through a workstation.

**Note:** To upgrade firmware, you will need:

- A personal computer (PC)
- Software capable of performing a Z-modem transfer (for example, Library Status tool, Windows Hyperteminal, or Procomm) and familiarity with this software
- An available serial port
- A cable for the PC's serial port (for more information on this cable, see the Upgrading Firmware section of the relevant library's user's guide)

## ■ Library Admin

The StorageTek L-series Library Admin is now available and optional for the L20/L40/L80 tape libraries. This is an upgrade version of the Library Status tool, that has enhanced maintenance and diagnostic capabilities. So, in addition to the features of the Library Status tool, the Library Admin includes the ability to:

- Get a virtual view of the library's cells.
- Obtain valuable statistics on the library, drives, cells, and the cleaning cartridge.

- View and modify the configuration of the library, drives, network, and also set the cleaning cartridge threshold. Under the network configuration, you can add and modify the SNMP agent and recipients.
- Run diagnostic routines such as the demo mode and library self-test. You can also remotely clean a drive.

## ■ Library Manager

The Library Manager is an optional software program that provides intelligent library control for StorageTek SCSI tape libraries, including the L Series libraries. The Library Manager's management and control features include the ability to bring SCSI libraries online and offline, and the ability to do tape operations, such as enter, eject, mount, dismount, or query tape cartridges.

## ■ Framework Library Monitor

The optional Framework Library Monitor is the first software that allows you to monitor and respond to StorageTek SCSI-based tape library events from within a system management framework (SMF).

# Typical Customer Environments

Enterprises of all sizes will benefit greatly from the StorageTek libraries' high performance, high availability, and flexibility. The libraries' architecture provides agility to accommodate future technological changes in the marketplace.

## ■ UNIX Networks

Organizations with large UNIX and NT networks gain a competitive advantage from the libraries' fast-loading speeds and parallel data paths, which speed throughput. Typical configurations for the L40 and L80 include database servers, application servers, and file servers.

## ■ Small and Midsize Environments

The libraries' high performance benefits small and midsize environments. Typical configurations include:

- L20 is especially useful for small environments.
- L40 and L80 can have multiple hosts to a single library.
- L40 and L80 are network-attached libraries for centralized monitoring and diagnosing machine performance.

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# High Availability and Reliability

The libraries meet or exceed the needs of the market segment that demands their ultra-high availability feature. In fact, reliability begins before you receive your tape library. The L20 tape library features a locking pin that holds the picker stationary during shipping, and the L40 and L80 are packed with foam to stabilize the robot. To set up the library, remove the locking pin or foam, connect the power, connect the host, add and configure the drives, label and add the cartridges, and apply power. The library is ready to go.

After the library is installed, StorageTek continues to provide you with maximum uptime and availability of your critical data. As the market leader in tape automation, StorageTek understands the critical library elements that improve the overall availability of the entire system.

In particular, StorageTek has focused on the following items to provide significant benefit to you, the customer:

- Robust Mechanical Design
- Fault-Tolerant Cooling System
- Critical Component Monitoring and Error Notification

## ■ Robust Mechanical Design

StorageTek brings enterprise-class reliability to the libraries. All subassemblies are streamlined; for example, cabling is simplified to reduce the number of connectors. Also, the hand (or picker) uses a quiet and simple design, which results in high performance.

The libraries use highly integrated electronics. All the main library functions reside on a single controller card, resulting in a more reliable, cost-effective solution than a motherboard with several plug-in modules. This minimalist approach enables the library to yield both high value and reliability.

**Table 9-1. Reliability Measurements**

Mean exchanges between failures	2,000,000
Mean time to repair	Less than 30 minutes
Mean time between failures	360,000 hours (full operation)

## ■ Fault-Tolerant Cooling System

In addition to the fans contained in each drive module, the libraries provide exhaust fans for cooling the library electronics. This cooling system continues to function while a cooling fan is replaced by a service representative.

StorageTek uses only the most reliable fans, which feature ball-bearing construction designed for a mean time between failures of 360,000 hours.

The library system constantly monitors the electronics module, and the microcode uses rotation sensing to detect the fan speed to maintain an optimum temperature. If a fan fails, the microcode displays an error on the operator panel.

## ■ Critical Component Monitoring and Error Notification

The libraries monitor their own critical components, such as the drives, robot, fan status, internal library temperature, and power supplies.

# Serviceability

10

All serviceable components are easily accessible, and StorageTek has designed your library for:

- [No Periodic or Scheduled Maintenance](#)
- [Hot-swappable Power Supplies \(L40/L80\)](#)

StorageTek offers several service options and safety features to help minimize downtime for your library.

- [Service Offerings](#)
- [Safety Features](#)

## ■ No Periodic or Scheduled Maintenance

StorageTek is the only library manufacturer to provide a robotic system designed to operate without scheduled or periodic maintenance for the entire life of the product. Your library continues to operate because its components do not require lubrication or belt retensioning.

## ■ Hot-swappable Power Supplies (L40/L80)

If a power supply fails, the library stays functional with all drives in the drive column operational. The only time that some drives might become non-operational is if the service circuit fails.

If your system includes the optional power system, you can replace the faulty power supply while the library is running. With the functional power supply still providing power to the robot and half the drive system, you can replace the faulty power supply and connect it into the drawer connectors.

## ■ Service Offerings

StorageTek has designed the libraries so the customer or end user can install and service the libraries at the CRU (customer replacement unit) level. The standard level of service and warranty offering is Advanced Exchange, however, both Elite and Select on-site services are available.

L20/L40/L80 availability is restricted to areas that can support the Advanced Exchange warranty offering. The L20/L40/L80 Advanced Exchange service warranty level does not require StorageTek to return the original serial number asset to the customer. The warranty entitles customers to 1 hour of free telephone installation support. Customers

with cases under warranty can submit calls to the Call Center at any time; however, StorageTek will only respond Monday through Friday, 8am to 5pm local time, excluding holidays.

Elite on-site service is StorageTek's comprehensive high-availability system support solution, and is in place to support around-the-clock, mission-critical computing environments. Select on-site service is designed for customers that are in need of business-critical support, 8 a.m. to 5 p.m. local time, Monday through Friday (9 x 5). The on-site offerings may be restricted in some geographies. StorageTek offers library installation service for a fee, which does not include drive installation.

StorageTek's international subsidiaries may establish their own Advanced Exchange processes, depending on their relationships with the distributors, customs, and taxation issues. They may have a unique warranty offering due to the differences in the warranty delivery processes.

The sales representative will ensure the customer is aware of all prerequisites and compatibility issues. The L20/L40/L80 Connectivity Matrix is on the L20/L40/L80 Web page on the CRC. StorageTek will not accept calls for software not listed in the matrix.

## ■ Safety Features

Safety features are incorporated into the libraries. If you unlock and open the front door (drawer in the L20), an interlock removes power from the robot. In addition, the LLC card and the AC power supply are housed inside the electronics module (in the L20 and L40) to prevent you from coming into contact with hazardous voltages and sensitive electronics.

# Specifications

A

This appendix provides specifications for the libraries.

**Table A-1. Environmental Specifications**

	<b>Operating</b>	<b>Storage</b>	<b>Transporting</b>
Temperature	+10 to +40°C +50 to +104°F	+10 to +40°C +50 to +104°F	-40 to +60°C -40 to +140°F
Humidity	20 to 80%	10 to 95%	10 to 95%
Wet bulb (maximum, noncondensing)	+29.2°C +84.5°F	+35°C +95°F	+35°C +95°F
Altitude	-76 to 3,048 m (-250 to 10,000 ft)		

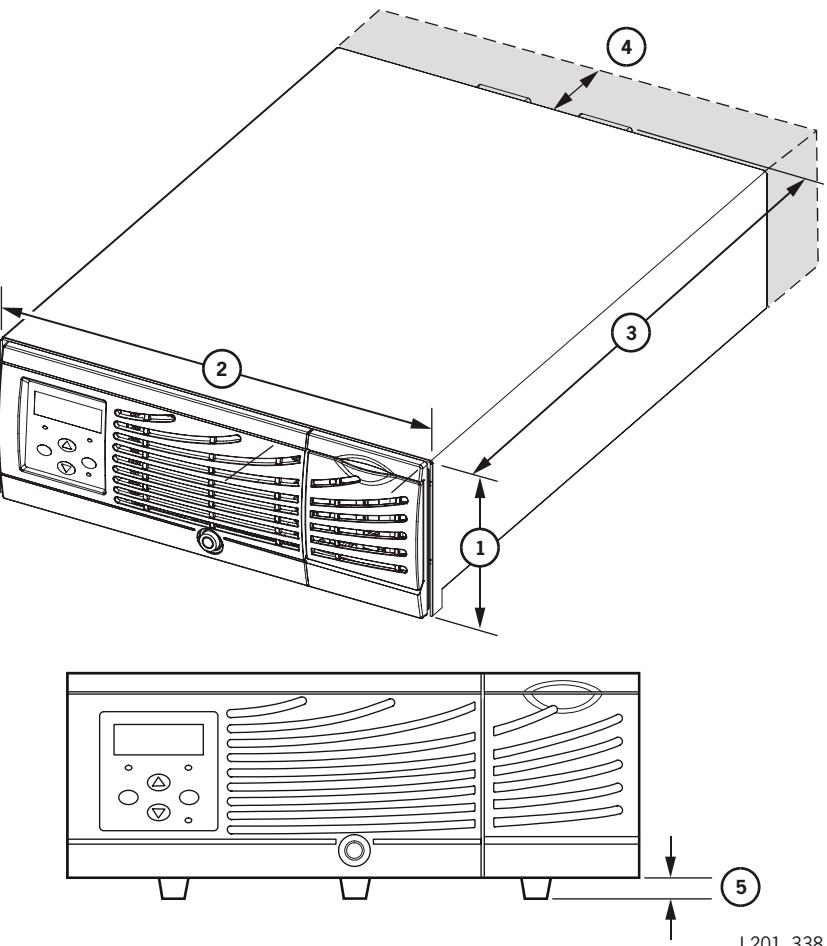
**Table A-2. L20 Power Specifications without Drives**

Input voltage	100–240 VAC, single phase
Frequency	50/60 Hz
Maximum power consumption (library)	1.4 A at 120 V <i>or</i> 0.71 A at 240 V
Maximum heat output	560 Btu/hr
Voltage-amperes	170 VA

**Table A-3. L40 and L80 Power Specifications without Drives**

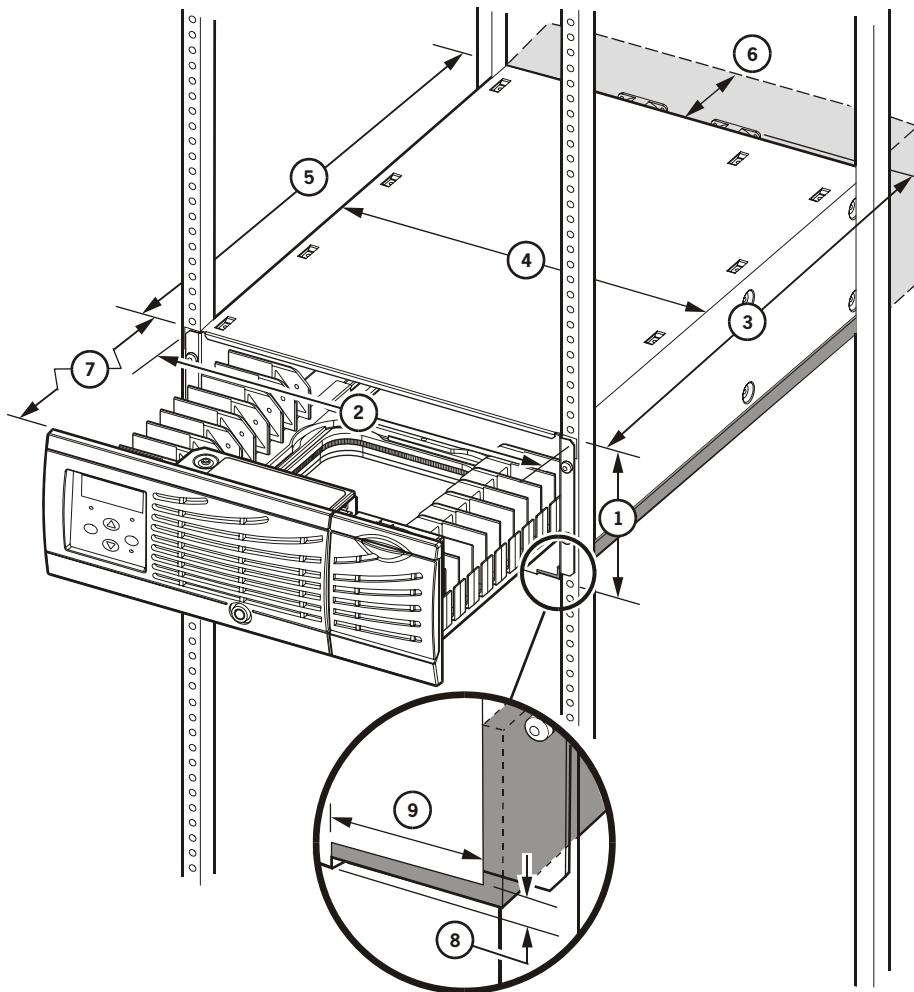
Input voltage	100–240 VAC, single phase
Frequency	50/60 Hz
Maximum power consumption (library)	1.42 A at 120 V <i>or</i> 0.75 A at 240 V
Maximum heat output	614 Btu/hr
Voltage-amperes	180 VA

**Figure A-1. L20 Tape Library, Desktop (L201\_338)**



1. 178 mm (7.0 in.) height
  2. 483 mm (19.0 in.) width
  3. 706 mm (27.78 in.) depth without cables
  4. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)
  5. 16 mm (0.625 in.) foot height
- Weight (library only): 23.4 kg (51.6 lb)

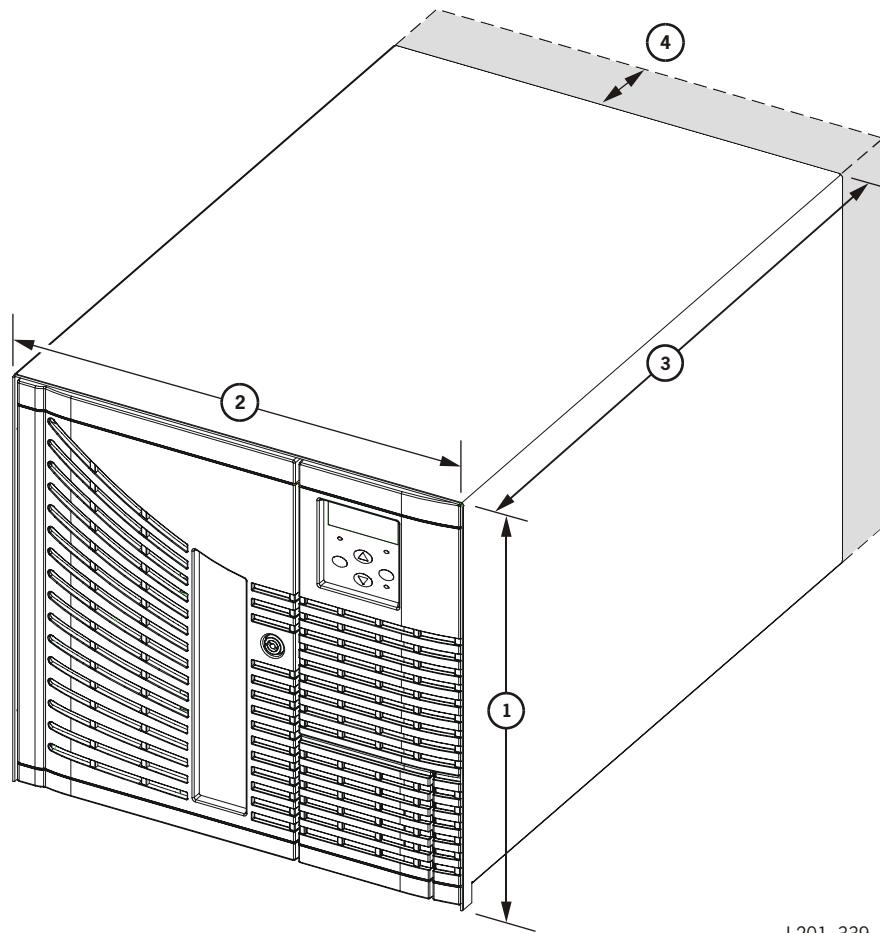
**Figure A-2. L20 Tape Library, Rack-installed (L201\_335)**



L201\_335

1. 176 mm (6.94 in.) height
  2. 484 mm (19.05 in.) width of front with flange
  3. 706 mm (27.78 in.) depth with fan, without cables
  4. 448 mm (17.65 in.) width
  5. 680 mm (26.78 in.) depth without fan, without cables
  6. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)
  7. 356 mm (14.0 in.) drawer travel distance
  8. 2.3 mm (0.090 in.) shaded area represents optional rail support
  9. 37 mm (1.44 in.)
- Weight (library only): 21.8 kg (48 lb)

**Figure A-3. L40 Tape Library, Desktop (L201\_339)**

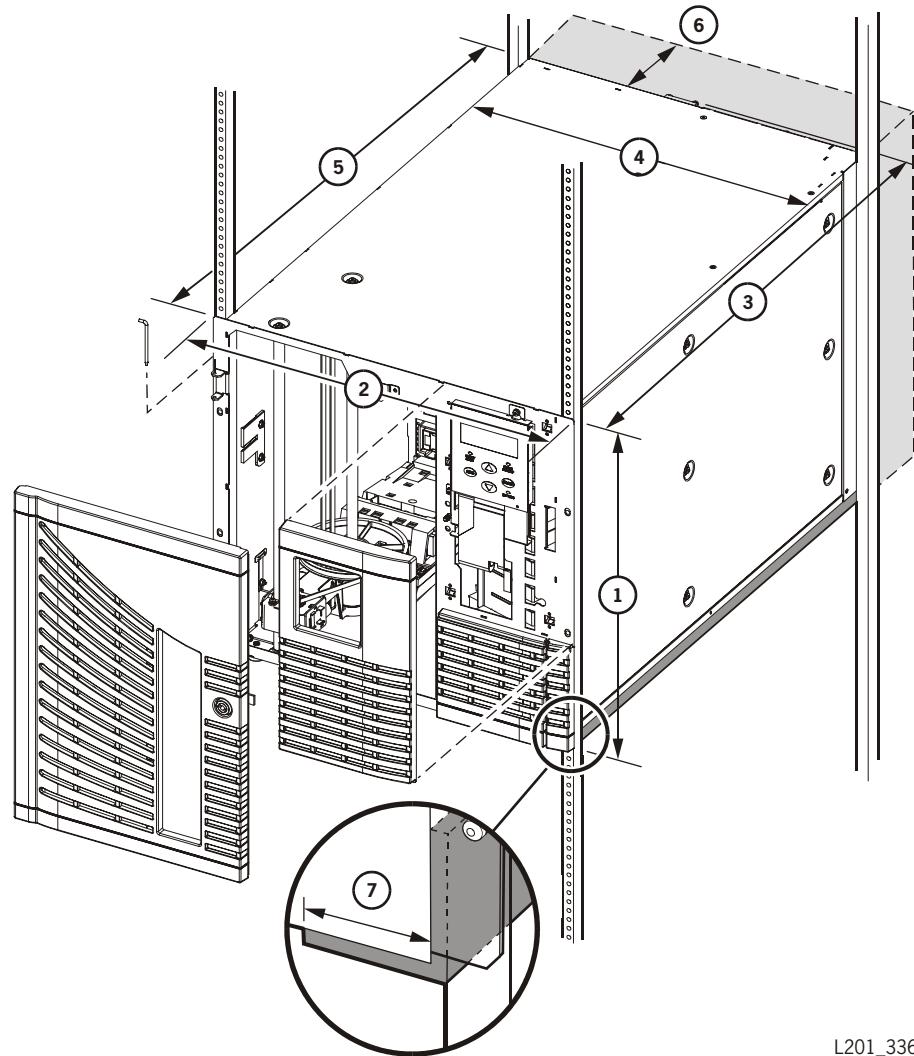


L201\_339

1. 455 mm (17.90 in.) height with feet; feet are 16 mm (0.625 in.)
2. 490 mm (19.30 in.) width
3. 724 mm (28.50 in.) depth without cables
4. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)

Weight (library only): 44.45 kg (98 lb)

**Figure A-4. L40 Tape Library, Rack-installed (L201\_336)**

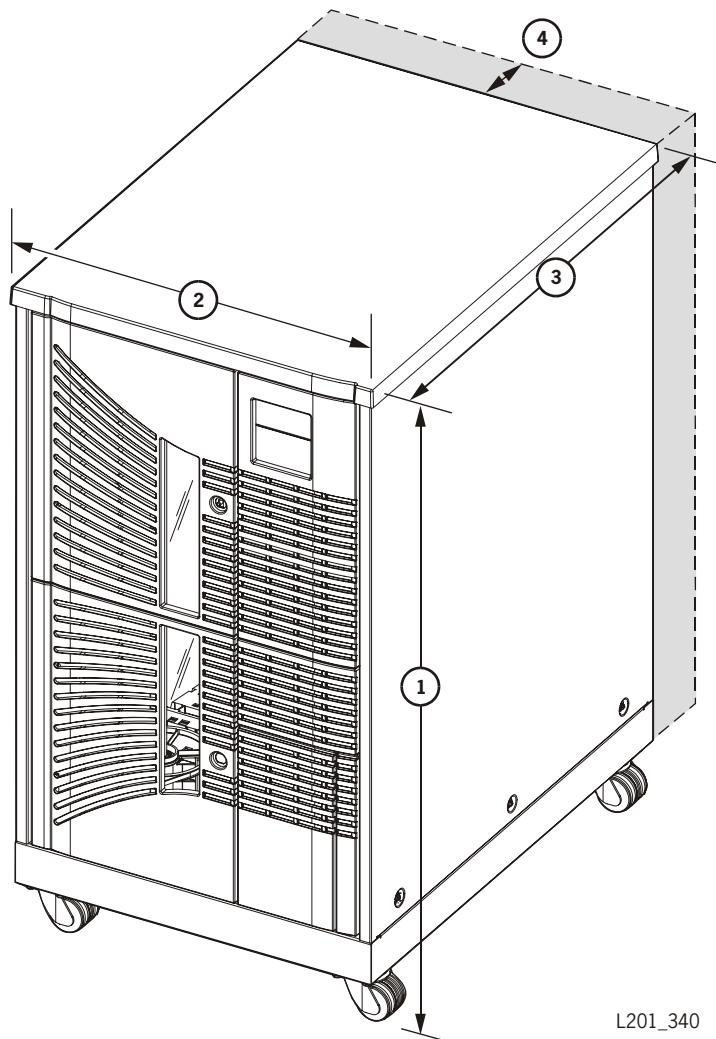


L201\_336

1. 442 mm (17.39 in.) height
2. 483 mm (19.0 in.) width of front with flange
3. 728 mm (28.65 in.) depth with fan, without cables
4. 448 mm (17.65 in.) width
5. 702 mm (27.65 in.) depth without fan, without cables
6. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)
7. 37 mm (1.44 in.) edge of library to inside edge of rail

Weight (library only): 44.45 kg (98 lb)

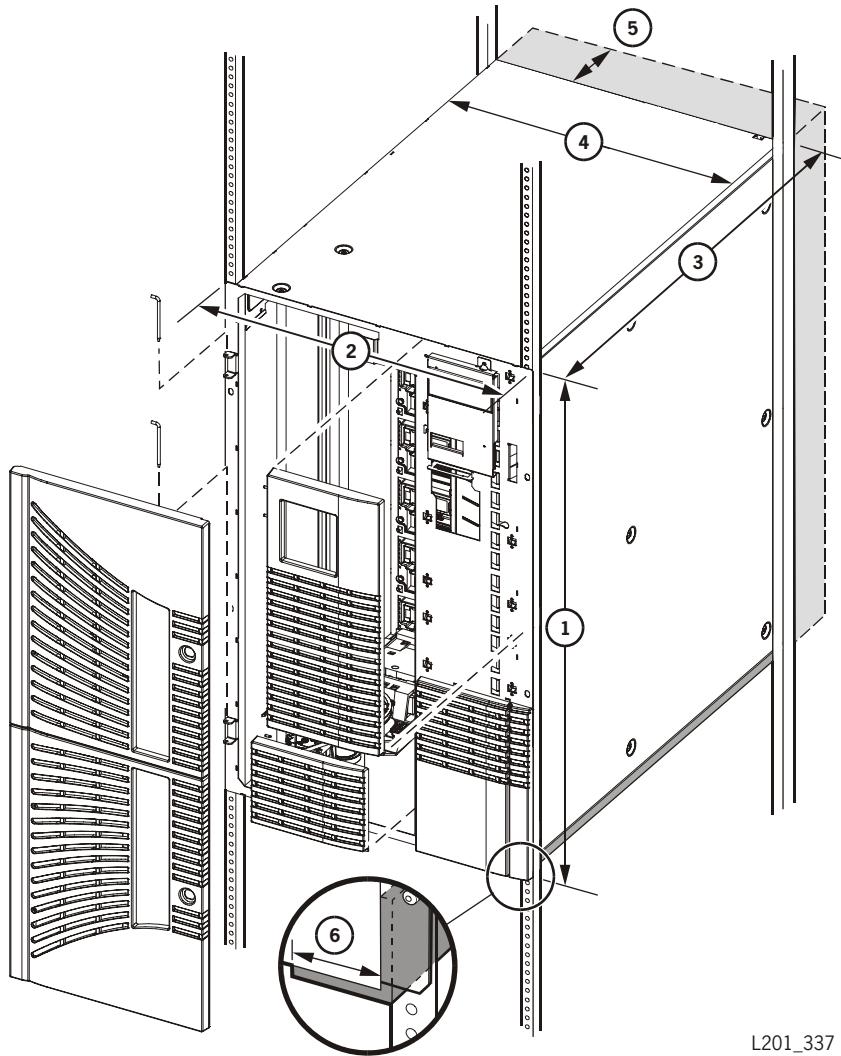
**Figure A-5. L80 Tape Library, Deskside (L201\_340)**



1. 1011 mm (39.80 in.) height including castors; castors are 72 mm (2.85 in.)
2. 540 mm (21.25 in.) width
3. 740 mm (29.15 in.) depth without cables
4. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)

Weight (library only): 63.5 kg (140 lb)

**Figure A-6. L80 Tape Library, Rack-installed (L201\_337)**



L201\_337

1. 797 mm (31.39 in.) height
2. 483 mm (19.0 in.) width of front with flange
3. 697 mm (27.44 in.) depth without cables;  
not shown: fans protrude 27 mm (1.06 in.) from back
4. 448 mm (17.65 in.) width
5. 102 mm (4.0 in.) dedicated fan exhaust clearance area (shaded volume provides for cable and cooling clearances)
6. 37 mm (1.44 in.)

Weight (library only): 63.5 kg (140 lb)

**Table A-4. Drive and Tray and Cartridge Weights**

DLT 8000 drive and tray	5.4 kg (12 lb)
Super DLT drive and tray	3.17 kg (7 lb)
DLT IV cartridge	223 g (7.9 oz)
HP Ultrium LTO drive and tray	5.0 kg (11 lb)
IBM Ultrium LTO drive and tray	5.8 kg (12.7 lb)
Seagate Ultrium LTO drive and tray	5.5 kg (12 lb)
Ultrium 100 GB cartridge	220 g (7.8 oz)

## ■ Drive Power Specifications

**Table A-5. Drive Power Specifications**

Drive	Volt Amperes	Current	Heat output
DLT 8000	65 VA	0.53 A at 120 VAC 0.27 A at 240 VAC	222 Btu/hr
Seagate/Certance <sup>1</sup> LTO	47 VA	0.38 A at 120 VAC 0.20 A at 240 VAC	160 Btu/hr
HP LTO	46 VA	0.37 A at 120 VAC 0.19 A at 240 VAC	157 Btu/hr
IBM LTO	69 VA	0.56 A at 120 VAC 0.29 A at 240 VAC	236 Btu/hr
Super DLT	58 VA	0.47 A at 120 VAC 0.24 A at 240 VAC	198 Btu/hr

1. Seagate/Certance is owned by Quantum Corporation.

## ■ Agency Certifications

**Table A-6. Agency Certifications**

<b>Category</b>	<b>Certification</b>
Safety	CSA standard CAN/CSA-C22.2 no. 950-M93
	UL standard 1950, Third Edition
	EN60950
Emissions	FCC 47, Part 15, Subpart B, Class A
	VCCI Class A
	European Union CE emissions standards
	Canadian EMC Law; ICES-003
Immunity	European Union CE immunity standards

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# Glossary

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This glossary defines terms and abbreviations in this and other product-related publications.

Some of the definitions are taken from other glossaries. The letters in the parentheses that follow some definitions indicate the source of the definition:

- (A) • *The American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI).
- (E) • The ANSI/Electronic Industries Association (EIA) Standard-440-A, *Fiber Optic Terminology*.
- (I) • The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and International Electrotechnical Commission (ISO/IEC/JTC1/SC1).
- (IBM) *The IBM Dictionary of Computing*, copyright 1994 by IBM.
- (T) International standards committee drafts, and working papers being developed by the ISO/IEC/JTC1/SC1.

## A

**A** Ampere.

**AC** alternating current.

**access time** The time interval between the time data is requested and data is delivered.

**adapter** A card that provides the physical interface between the host system I/O bus and the SCSI or Fibre channel bus. *See also* host bus adapter.

**application software** Software that is specific to the solution of an application problem.

**audit** An operation to catalog or record the physical location of a cartridge tape in an automated library.

**auto clean** A feature of an automated library that allows a cleaning cartridge to automatically be inserted into a drive when a drive indicates that it requires cleaning. The host software must support the auto clean function.

**automated mode** A relationship between a library and the client. In automated mode, the robot moves the cartridges among the storage cells, CAP, and drives in response to client commands. This is the normal operating mode of a library that is communicating with the client.

## B

**B** *See* byte.

**backward read compatible (BRC)** The ability of an SDLT 220 tape drive to read recorded data from an earlier version of DLT tape drive. *Contrast with* non-backward read compatible (NBRC).

**baud** The communications transfer rate for serial data.

**bit** (1) A unit of information equal to a 1 or a 0.

**British thermal unit (Btu)** A standard measure of a device's heat output. The amount of heat required to raise one pound of water one degree Fahrenheit.

**Btu** *See* British thermal unit.

**bus** A facility that transfers data between two devices with only one device having control at a time.

**byte** A number of bits, treated as a unit, and representing a character.

**C**

**C** (1) Celsius. (2) Centigrade.

**camera** A system that reads volume serial number labels on cartridges, instead of scanning the labels with a laser. A camera performs faster and more accurately than a laser scanner.

**CAP** *See* cartridge access port.

**cartridge** A storage device that consists of magnetic tape on supply and take-up reels, in a protective housing. (IBM)

**cartridge access port (CAP)** A device in the library that allows an operator to insert or remove cartridges during library operations.

**cartridge drive** The unit that houses the magnetic-tape transports and controllers that store and retrieve data for the host system in a cartridge subsystem.

**cartridge tape** A composite of the plastic housing and the magnetic tape.

**catalog** (1) The inventory of all cartridge tape storage locations in a library; this inventory is by library number, panel, row, column. (2) A stored list of backed up files and directories and the locations of the backup copies.

**cell** The location in the library in which a cartridge is stored.

**cleaning cartridge** A cartridge that contains special material to clean the tape path in a drive.

**cleaning cells** *See* reserved cells.

**client server** The primary computer on a network, with which other computers interact. A server is a processor, usually composed of a central processing unit and memory, that typically communicates with peripheral devices over channels or networks, to perform input/output operations such as network control. It also provides end users with computation services and database access. Also called host.

**command line interface (CLI)** The CSE port on the LLC card.

**config** *See* configuration.

**configuration (config)** The physical description of a library listing the panel types, cartridge capacity, type of host connection, and number of drives.

**configuration error** An error that results from incorrect configuration values.

**controlling (host) software** The logical interface between the host operating system and the library components.

**CRU** *See* customer replaceable unit.

**CSE port** A slot that enables a remote or laptop computer user to run diagnostic tests, examine the fault symptom code (FSC) log, download firmware, or connect the library to a remote modem.

**customer replaceable unit (CRU)** (1) An assembly that a customer is allowed to replaced in its entirety when it fails.

**Customer Resource Center (CRC)**

StorageTek's Web-based service that provides technical information to customers with StorageTek maintenance contracts. A log-in and password are required.

**D**

**daisy chain** (1) A method of device interconnection for determining interrupt priority by connecting the interrupt sources serially. (2) A device interconnection cable.

**diagnostic cartridge** A data cartridge with a "DG" label, which is used for diagnostic routines.

**diagnostic tests** Automated offline tests that a service representative uses to evaluate and troubleshoot equipment.

**DC** Direct current.

**differential (diff)** A SCSI bus alternative that provides better signal quality with less crosstalk and noise but requires more power to drive the signal. The maximum cable length is 25 m (82 ft.).

**differential operation** A SCSI bus alternative in which the signal from the SCSI chip passes through a set of differential drivers and receivers. This alternative provides better signal quality with less cross-talk and noise but requires more power to drive the signal. *Contrast with* single-ended operation.

**Digital Linear Tape (DLT)** (1) A trademarked name for Quantum cartridge tapes and drives. (2) A type of magnetic tape storage device marketed by several companies. DLT cartridges are ½-inch wide and come in several sizes ranging from 20 to over 80 GB.

**dismount** To remove a cartridge from a drive.

**DLT** *See* Digital Linear Tape.

**DLT1** A low cost, high-capacity tape drive manufactured by Benchmark Storage Innovations and Quantum Corporation. It features a native capacity of 40 GB using DLTtape IV media with a sustained transfer rate up to 3 MB/s.

**domain** (1) A shared user authorization database which contains users, groups, and their security policies. (2) A set of interconnected network elements and addresses that are administered together and that may communicate.

**Domain Name Service (DNS)** A service that translates domain names into IP addresses. Because domain names are alphabetic, they are easier to remember than IP addresses. *See* library name.

**door interlock switch** A switch that disconnects power to the library when the front door is opened.

**drive** An electromechanical device that moves magnetic tape and includes the mechanisms for writing and reading data to and from the tape.

**Dynamic Host Configuration Protocol (DHCP)** (1) Server software that automatically sets the library IP address, subnet mask, and name. (2) Server software that automatically sets IP address, net mask, and gateway. (IBM)

## E

**electronics module** A unit in the library consisting primarily of the internal LLC card, interface connections, and the personality module on the EM frame.

**electrostatic discharge (ESD)** An undesirable discharge of an accumulated electrical charge (static) that can severely damage delicate components and degrade electrical circuitry.

**element** An externally addressable component of a library, such as a drive, CAP, or storage cell.

**enabled** (1) Active. (2) On.

**ESD** *See* electrostatic discharge.

**Ethernet** A 10 Mb/s baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission. Ethernet uses carrier sense multiple access with collision detection. (IBM)

**Ethernet address** A six-byte address that makes a library accessible to a network. *See also* Ethernet, Internet Protocol (IP) address, library name, and subnet mask.

**Event log** A file, accessible through the operator panel, that contains events that occurred during the functional operation of the library.

## F

**F** Fahrenheit.

**fast load** A mode of library operation permitting the robot to retrieve another cartridge before receiving load confirmation from a drive.

**fault symptom code (FSC)** A four-character hexadecimal code generated in response to an error to help isolate failures within the device.

**FRU** *See* field replaceable unit.

**fiber-optic cable** A jacketed cable of thin strands of glass that carries pulses of light that transmit data for high-speed transmissions over medium to long distances. The cable can be single mode, which carries a single signal from a laser or light-emitting diode light source, or multimode, which carries multiple signals from either light source.

**fiber optics** The branch of optical technology concerned with the transmission of radiant power through fibers made of transparent materials such as glass, fused silica, and plastic. (E)

**Fibre Channel (FC)** The standard from the National Committee for Information Technology Standards that defines an ultra high-speed, content-independent, multilevel data transmission interface that supports multiple protocols simultaneously. Fibre Channel supports connectivity to millions of devices over copper and/or fiber-optic physical media and provides the best characteristics of both networks and channels over diverse topologies.

**field replaceable unit (FRU)** An assembly that is replaced in its entirety when any one of its components fails. (IBM)

**file-protect** To prevent the destruction or overwriting of data stored on cartridge tape. *See also* write-protect.

**firmware** An ordered set of instructions and data stored in a way that is functionally independent of main storage; for example, microprograms stored in a ROM. (I) Also known as “microcode.”

**FSC** *See* fault symptom code.

## G

**g** gram.

**Gateway** A 32-bit, or 4-byte number, in dotted decimal format (typically written as four numbers separated by periods, such as 107.4.1.3 or 84.2.1.111) that is applied to an IP Address to identify router interface.

**GB** *See* gigabyte.

**get** An activity in which a robotic hand obtains a cartridge from a cell or drive.

**gigabyte (GB)** One billion ( $10^9$ ) bytes. When referring to memory capacity, 1,073,741,824 in decimal notation. (IBM)

## H

**HBA** *See* host bus adapter.

**hand assembly** A part of the library robot whose function is to grasp cartridges and move them between storage cells and drives. A camera on the hand assembly reads cartridge volume labels.

**Hertz (Hz)** A unit of frequency equal to one cycle per second. For example, in the United States, power line frequency is 60 Hz, or a change in voltage polarity 120 times per second.

**high voltage differential (HVD)** A type of SCSI interface. The HVD interface allows longer cable lengths of up to 25 m (82 ft), but throughput is slower in data transfer rates than LVD (low voltage differential).

**host** The primary computer on a network, with which other computers interact.

**host bus adapter (HBA)** A circuit installed in a multi-platform host or device that interfaces between the device and the bus.

**host controlling software** The logical interface between the host operating system and the library components.

**hot swapping** A method of component replacement in which the system containing the component remains online during removal of the failed component and insertion of a replacement.

**Hz** *See* Hertz.

## I

**in.** *See* inch.

**inch** A unit of measure equal to 25.4 mm.

**indicator** A device that provides a visual or other indication of the existence of a defined state. (T)

**initialization** The operations required for setting a device to a starting state, before the use of a data medium, or before implementation of a process. (T)

**initial program load (IPL)** A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at initial program load execution. Devices running firmware usually reload the functional firmware from a diskette or disk drive at initial program load execution.

**interface** Hardware, software, or both, that links systems, programs, or devices. (IBM)

**Internet Protocol (IP)** A stacked set of protocols, developed by the United States Department of Defense, to facilitate communication between dissimilar computers over networks.

**Internet Protocol (IP) address** A four-byte value that identifies a library and makes it accessible through a network. IP addresses are logically divided into two parts: the network (similar to a telephone area code), and the system on the network (similar to a phone number). *See also* Ethernet address, library name, subnet mask.

**intervention required** Operator action is required (such as removing a cartridge from the drive).

## K

**kb** *See* kilobit.

**kB** *See* kilobyte.

**kilobit (kb)** (1) One thousand bits ( $10^3$  bits). (2) 1,024 bits ( $2^{10}$ ) of storage.

**kilobyte (kB)** (1) One thousand bytes ( $10^3$  bytes). (2) 1,024 bytes ( $2^{10}$ ) of storage.

**kilovolt-ampere (kVA)** An electrical unit of power equal to one thousand volt-amperes.

**kVA** *See* kilovolt-ampere.

## L

**label** An identifier associated with a removable media or cartridge. Labels may be humanly readable, machine readable, or both. *Synonymous with VOLSER and volume serial number.*

**lb** An abbreviation for pound.

**leader block.** The mechanism that loads the tape through the tape path of a drive.

**Library Admin** *See* StorageTek L-Series Library Admin.

**library name** An assigned name that maps to the Internet Protocol (IP) address for a library. *See also* Ethernet address, Internet Protocol (IP) address, subnet mask.

**Library Status tool** A proprietary software that resides internal to the library and is activated using a Web browser. It is used to monitor the library, load code, reboot library, and to generate reports on library, drives, fault symptom codes (FSCs), and tape inventory.

**Linear Tape-Open (LTO)** A technology developed jointly by HP, IBM, and Seagate for new tape storage options. LTO technology is an open format, which means that users have multiple sources of products and media. The open nature of LTO technology also provides a means of enabling compatibility between different vendors' offerings.

**low voltage differential (LVD)** A type of SCSI interface. LVD interface restricts cable lengths, 12 m (30.4 ft), but provides faster throughput.

**M**

**m** *See* meter.

**mA** Millampere or one one-thousandth ( $10^{-3}$ ) of an ampere.

**magazine** A container that holds cartridges in the cells provided and is inserted into the CAP.

**magnetic tape** A tape with a magnetizable layer on which data can be stored. *Synonymous with tape.*

**Main menu** The top-level menu on the operator panel display.

**manual mode** A relationship between a library and all attached clients. Tape libraries operating in manual mode have been placed offline to all client CPUs and require human assistance to perform cartridge operations.

**Mb** *See* megabit.

**MB** *See* megabyte.

**Mb/s** Megabits per second.

**MB/s** *See* megabytes per second.

**media type** A type of removable media. For example, a DLT IV media type indicates that the cartridge is for use in a Quantum DLT drive.

**megabit (Mb)** (1) One million ( $10^6$ ) bits. (2) 1,048,576 ( $2^{20}$ ) bits of storage.

**megabyte (MB)** (1) One million ( $10^6$ ) bytes. (2) 1,048,576 ( $2^{20}$ ) bytes of storage.

**megabytes per second (MB/s)** A measurement that usually describes the speed of data transfer.

**meter (m)** A metric measurement of length equal to 1.0936 yards, 3.2808 feet, or 39.3696 inches.

**micro (μ)** A prefix that means one one-millionth ( $10^{-6}$ ).

**microcode** *See* firmware.

**millimeter (mm)** A unit of measure equal to one-thousandth ( $10^{-3}$ ) of a meter or 0.04 in.

**millisecond (ms)** One thousandth ( $10^{-3}$ ) of a second.

**milliwatt (mw)** One thousandth ( $10^{-3}$ ) of a watt.

**mm** *See* millimeter.

**mount a cartridge** The process by which the library robot retrieves a cartridge from a cell and places it into a drive.

**ms** *See* millisecond.

**mV** Millivolt or one one-thousandth ( $10^{-3}$ ) of a volt.

**mw** *See* milliwatt.

**N**

**network** An arrangement of nodes and branches that connects data processing devices to one another through software and hardware links to facilitate information interchange.

**network file system (NFS)** A distributed file system and its associated network protocol.

**network gateway** A four-byte notation that makes the library accessible to a large network, which consists of two or more subnets, through a gateway connection.

**non-backward read compatible (NBRC)**

The inability of an SDLT 220N tape drive to read recorded data from an earlier version of DLT tape drive. *Contrast with* backward read compatible (BRC).

**O**

**offline** Neither controlled by, nor communicating with, a computer.

**online** Pertaining to the operation of a functional unit when under the direct control of the computer.

**open fiber control (OFC)** Open Fiber Control (OFC) cables incorporate a safety mechanism that prevents damage to the human eye when the connection (link) is disconnected.

**operator panel** (1) A panel that enables a user to configure and diagnose the library or drive. (2) The user interface for libraries or drives.

**operating system** Software that controls the execution of program and that may provide services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominately software, partial hardware implementations are possible. (T)

**oz** An abbreviation for ounce. A unit of weight equal to 28.35 grams.

## P

**peripheral device** Any device that communicates with a particular host or computer. Peripheral devices include disk subsystems, tape subsystems, printers, scanners, CD-ROMs, optical devices, and communication devices.

**personality module** A connector key, which connects to the library through a DB9 connector. The personality module stores the library cell capacity information.

**picker** *See* hand assembly.

**port** (1) A specific communications end point within a host. A port is identified by a port number. (IBM) (2) A specific end-point for communications within a host or from a host to a peripheral device or vice versa. (3) In Fibre Channel, it is an access point in a device where a link attaches. Examples of this port are N\_Port, NL\_Port, F\_Port, and FL\_Port.

**put** An activity in which a robotic hand releases a cartridge into a cell or drive.

## Q

**quiesce** (1) Allowing all activity to complete before any new activity is allowed to start. (2) To bring a device or an application to a state where all processing has been suspended and there are no tasks in progress.

## R

**redundant power supply** This power supply shares the power load with the standard power supply so that if one component were to fail, the other supply could take over fully without interruption to the library operation.

**reserved cells** The cells in the library in which only cleaning cartridges, diagnostic cartridges, or swapped data cartridges may reside. Only one of these cells is a swap cell.

**robot** An electromechanical device that moves cartridges among the cartridge access ports, the storage cells, and the drives.

## S

**s** Seconds.

**safety interlock switch** A switch that disconnects power to the library when the front door is opened.

**SCSI bus** The interface connecting peripheral devices to a host operating system.

**SCSI device** A host adapter or control unit attached to the SCSI bus. *Synonymous with target.*

**SCSI ID** The bit-significant representation of an address on the SCSI bus.

**Simple Network Management Protocol (SNMP)** A protocol for monitoring and managing systems and devices in a network.

**single-ended operation** A SCSI bus alternative in which the signal passes directly between SCSI chips on either end of the cable. *Contrast with differential operation.*

**small computer systems interface (SCSI)**

A local interface operating over a wide range of transfer rates using a common command set for all devices attached to the interface. It connects host computer systems to a variety of peripheral devices.

**SNMP** *See* Simple Network Management Protocol.

**storage cells** The locations where cartridges are kept in the library.

**StorageTek L-Series Library Admin** An optional interface that simulates internet browser operation for the library. This is an upgrade of the Library Status tool.

**submenu** A menu related to and reached from a main menu. (IBM)

**subnet mask** A four-byte notation that resolves routing within a network. *See also* Ethernet address, Internet Protocol (IP) address, library name.

**Super DLT** The next generation of DLT (Digital Linear Tape) products, which remains a standard for mid-range operating systems.

**swap cell** The cell among the reserved cells into which the robot might temporarily place a cartridge.

**T**

**tape** *See* magnetic tape.

**tape drive** *See* drive.

**tape transport interface (TTI)** An interface to control/monitor tape movement.

**target** A machine-readable optical pattern used to determine robot position. *See also* SCSI device.

**theta motor** The motor responsible for the lateral movement of the hand assembly in the library.

**thumbscrew** The large, cylindrical, rough-edged handle on the rear of a drive tray that, when

a person turns it, lets the person secure the drive to the drive column.

**U**

**Ultrium** The single hub implementation of the LTO specification for tape storage devices.

**V**

**V** Volts, usually expressed as VAC (volts alternating current) or VDC (volts direct current).

**VAC** Volts alternating current.

**VDC** Volts direct current.

**VOLSER** *See* volume serial number.

**volume** A data carrier that mounts and dismounts as a unit; for example, a reel of magnetic tape or a disk pack.

**volume serial number (VOLSER)** An alphanumeric label that the host software uses to identify a volume. It attaches to the spine of a cartridge and is both human- and machine-readable.

**W**

**warning count** A user-determined limit that indicates the number of times a cleaning cartridge will be used before it must be exported from the library.

**write-enabled** A setting on cartridge tapes that allows data to be written on the tape.

**write-protect (WP)** To set the switch on a cartridge tape to prevent data from being written on the tape. Reading data is still possible. *See also* file-protect.

**Y**

**Y-cable** A communications cable that has two connectors at one end and one connector at the other.

**Z**

**Z carriage** The portion of the robot on which the hand assembly rests.

**Z motor** The motor responsible for the vertical movement of the hand assembly in the library.

**Z shafts** The columns (or tubes) which allow the hand assembly in the library to move vertically.

## Glossary

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